

REMARKS

Claims 1-9, 11-14 and 16-20 are pending in this application.

Claims 10, 15, 21 and 22 are cancelled.

Claims 13-17 are withdrawn from consideration as being drawn to non-elected subject matter. Claims 13, 14, 16 and 17 have been amended so as not to depend from cancelled claims.

Independent claims 7-9, 18 and 19 have been amended to recite the **combination** of a thermoplastic resin with a specific swelling ratio and at least one other thermoplastic resin of cancelled claim 21. It is clear from the claims that the thermoplastic resin having a specific swelling ratio is not the same as the "at least one other thermoplastic resin". Also, these claims further define the embodiment when the "at least one other thermoplastic resin" is a PVDF polymer. Support for the amendment can be found on page 19, lines 19-30.

For consistency, the "wherein" clause of claims 9 and 14 has been deleted.

No new matter has been added by way of the above-amendment.

Issues Under 35 U.S.C. § 103

Claims 7-12 and 18-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Venugopal et al., US 5,558,959 and claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over

Venugopal et al. and Katsurao et al. US 6,372,388. Applicants respectfully traverse these rejections.

As the Examiner will recall, Applicants responded to the rejections based on Venugopal et al. (as set forth in the December 19, 2003 Office Action) by amending the claims so that each independent claim (7-9, 18 and 19) recites a binder composition comprising a thermoplastic resin having a swelling ratio of 150 to 800% and contains aliphatic ester units within the thermoplastic polymer having a structure of general formula (1).

In response to this amendment, the Examiner has maintained the rejection of claims 7-12 and has newly rejected claims 18-21 over the Venugopal reference. In addition, the Examiner has rejected claim 22 over the combination of Venugopal in view of Katsurao et al., US 6,372,388.

In response, Applicants have amended hereinabove independent claims 7-9, 18 and 19 to recite the **combination** of a thermoplastic resin with a specific swelling ratio and "at least one other thermoplastic resin" of cancelled claim 21. This combination requires further clarification in light of the Examiner's comments in the outstanding Office Action.

In the outstanding Office Action, the Examiner has taken the position that the polyurethane of Venugopal would constitute a "synthetic rubber" as described in claim 21. In other words, the Examiner has taken the position that the polyurethane of Venugopal

meets the swelling ratio limitation of the inventive independent claims and at the same time meets the "synthetic rubber" limitation of claim 21. Applicants respectfully submit that this interpretation of claim 21 is improper.

Applicants respectfully submit that a proper interpretation of independent claims 7-9, 18 and 19 would be to require a **combination** of a thermoplastic resin with a specific swelling ratio and "at least one other thermoplastic resin". In view of the fact that Venugopal fails to teach or fairly suggest the **combination** of a thermoplastic resin with a specific swelling ratio and "at least one other thermoplastic resin selected from the class consisting of a flouropolymer, a synthetic rubber, a polyolefin and a polyether", the presently claimed invention is patentable over Venugopal, taken alone.

Applicants now turn to the secondary reference of Katsurao et al. The Examiner cites Katsurao et al. for teaching that it would be obvious to add a polyvinylidene fluoride (PVDF) polymer to the polyurethane resin of Venugopal.

However, Applicants note that the PVDF described in Venugopal has specific high temperature resistance properties, which is distinct from the PVDF of the present invention. Applicants have amended the claims hereinabove to highlight this distinction.

An important object of the invention of Katsurao et al. is to have enhanced heat resistance of the PVDF. To achieve this object,

Katsurao et al. introduce 0.1 to 5 mol. % of a monoester of unsaturated dibasic acid or an epoxy group containing vinyl monomers and chemically or physically crosslinks the polymer. See column 4, lines 23-29, column 6, lines 18-24, and column 8, line 54 to column 9, line 5.

Accordingly, Applicants have amended independent claims 7-9, 18 and 19 to recite the following proviso which highlights the distinction between the PVDF polymers of Katsurao et al. and the inventive PVDF polymers:

"with the proviso that when the residue of the thermoplastic resin in the binder composition is a polyvinylidene fluoride, the glass transition temperature of the binder composition is lower than the freezing point of the electrolyte solution".

Thus, the inventive compositions comprising PVDF have a low temperature capability which would not be seen with the high temperature resistant PVDF polymers of Katsurao et al.

In support of the non-obviousness of the inventive composition which contains a thermoplastic resin having a PVDF residue, the Examiner's attention is directed to the exemplified embodiments within the present specification. The relevant experimental examples are shown in the following table for the Examiner's convenience:

	Positive electrode binder	Separator	Negative electrode binder	Low temperature capability (%)
Example 10 (secondary cell 9)	Polycaprolactone PU (5 wt%) + PVDF (95 wt%)	PP/PE/PP	Polycaprolactone PU (5 wt%) + PVDF (95 wt%)	87.6
Example 11 (secondary cell 10)	Polycaprolactone PU (1 wt%) + PVDF (99 wt%)	PP/PE/PP	Polycaprolactone PU (1 wt%) + PVDF (99 wt%)	75.2
Example 15 (electrical double-layer capacitor 3)	Polycaprolactone PU (5 wt%) + PVDF (95 wt%)	PTFE	Polycaprolactone PU (5 wt%) + PVDF (95 wt%)	80.2
Comparative Example 4 (secondary cell 12)	PVDF	PP/PE/PP	PVDF	60.8
Comparative Example 6 (electrical double-layer capacitor 5)	PVDF	PTFE	PVDF	71.4

Low-temperature capability (%): (discharge capacity at -10°C) / (discharge capacity at 25°C) x 100

As can be seen from the above-data, the introduction of just 1% polycaprolactone PU into the binder composition increases the low temperature capability 24% (compare inventive Example 11 having a low temperature capability of 75.2% with Comparative Example 4 having a low temperature capability of 60.8%). Also, the addition of 5% polycaprolactone PU into the binder composition increases the low temperature capability 12% (compare inventive Example 15 having a low temperature capability of 80.2% with Comparative Example 6 having a low temperature capability of 71.4%).

This improvement to the low temperature properties would not be expected by modifying the polyurethane compositions Venugopal

with the Katsurao et al's high temperature resistant PVDF having 0.1 to 5 mol. % of a monoester of unsaturated dibasic acid or an epoxy group containing vinyl monomers which is chemically or physically crosslinked.

In view of the above-considerations, it is clear that a *prima facie* case of obviousness cannot be said to exist over Venugopal, as taken alone or in combination with Katsurao et al. As such, withdrawal of the rejections is respectfully requested.

Conclusion

With the above remarks, Applicants believe that the claims, as they now stand, define patentable subject matter such that passage of the instant invention to allowance is warranted. A Notice to that effect is earnestly solicited.


Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact **Garth M. Dahlen, Ph.D., Esq.** (Reg. No. 43,575) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees

required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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